

In the disclosed embodiments of the invention, a relatively small amount of the endpoint detection material is implanted beneath the surface of the microelectronic substrate at a depth "d" which, when reached by the planarizing process, is indicative of having achieved a blanket surface for the microelectronic substrate. In addition, the endpointing material is implanted in a specified thickness "t" at the selected depth d below the surface of the microelectronic substrate. The implanted substance may implanted in the substrate at a concentration that does not affect the electrical properties of the microelectronic substrate, for example at about 0.0001% to about 0.1%, as disclosed in the specification at page 11, lines 23-30. Additionally, the distance d may be about 200 Å and the thickness t may be about 100 to 500 Å. During the planarization of the disclosed substrate, the implanted materials released into the slurry are detected using mass spectroscopy, emission spectrometry or similar analyzers configured to detect minute amounts of the implanted material. The first detection of the endpointing material at the first depth d indicates that planarization has gone at least to the predetermined depth. The last detection of the endpointing material indicates that planarization has continued at least to a depth equal to the thickness t of the endpointing material beneath the surface, indicating that planarization has formed a blanket surface and is therefore complete.

The Examiner again cites the Naoki reference. Naoki discloses a planarization apparatus having a mass spectrometer for detecting the endpoint of the planarization process. However, Naoki fails to disclose such an apparatus configured with the type of microelectronic substrate disclosed by the applicant. As emphasized earlier, the microelectronic substrate disclosed by Naoki includes *a layer of P doped SiO₂ over a layer of undoped SiO₂*. The undoped SiO₂ layer *is not* a second substance implanted at specified depth d and a thickness t below the surface of the substrate. The apparatus of Naoki is thus configured with a different type of microelectronic substrate, so that the detection of the endpoint of planarization is not based on detecting an implanted substance within the lower layer, but on detecting the disappearance of the doped substance from the upper layer. Moreover, the doped upper layer would not reasonably be considered to be the same as substance of 0.0001% to 0.1% implanted in a lower layer that does not affect the electrical properties of the microelectronic substrate since doping of the upper layer is precisely for the purpose of altering the electrical properties of the upper layer.

The Examiner also cites the Meikle reference, which is directed only to detecting the presence of a second titanium layer beneath a first layer of titanium. Since the titanium is unquestionably the second layer, it is not a substance *implanted* at a distance d below the surface of the first layer. To be implanted, by definition, means that *a first substance is placed within a second substance*.

Turning now to the claims, distinguishing differences between the language and the applied art will specifically be pointed out. Claim 68, as amended, recites in pertinent part, “An apparatus for detecting the endpoint of a planarizing process comprising...a microelectronic substrate having a top surface formed of a first substance, and a second substance, *the second substance being implanted at a concentration of approximately 0.001% to approximately 0.1% of the first substance, and at a distance d as a layer with a thickness t beneath the top surface of the microelectronic substrate, the microelectronic substrate being configured with...*” (Emphasis added). Naoki does not teach or fairly suggest this. Instead, Naoki teaches a layer of P doped SiO₂ over a layer of undoped SiO₂. As noted above, the undoped SiO₂ layer is not a second substance implanted at specified depth d and a thickness t below the surface of the substrate. The Meikle reference also fails to disclose or fairly suggest this. Instead, Meikle discloses two separate metal layers, and cannot fairly be read to assert that one layer is implanted into the other. Claim 68 is therefore allowable over the cited art. Claims depending from claim 68 are also allowable based upon the allowable form of the base claim and further in view of the additional limitations recited in the dependent claims.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned “Version with Markings to Show Changes Made”.

All of the claims remaining in the application are now clearly allowable.
Favorable consideration and a Notice of Allowance are earnestly solicited.

Respectfully submitted,

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SHA/ln

Enclosures:

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Fee Transmittal Sheet (+ copy)

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

68. (Twice Amended) An apparatus for detecting the endpoint of a planarizing process comprising a microelectronic substrate having a top surface formed of a first substance, and a second substance, the second substance being implanted at a concentration of approximately 0.001% to approximately 0.1% of the first substance, and at a distance d as a layer with a thickness t beneath the top surface of the microelectronic substrate, the microelectronic substrate being configured with;

a planarizing device having a first portion and a second portion movable relative to the first portion to remove material from the microelectronic substrate positioned therebetween, the material including atoms of the first and second substances;

transport means to move the material from the planarizing device; and

a mass spectrometer coupled to the transport means to receive the material and detect the atomic mass of the second substance.